

Solar Electric Propulsion (SEP)

Active Technology Project (2014 - 2023)



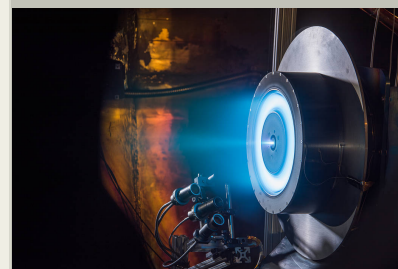
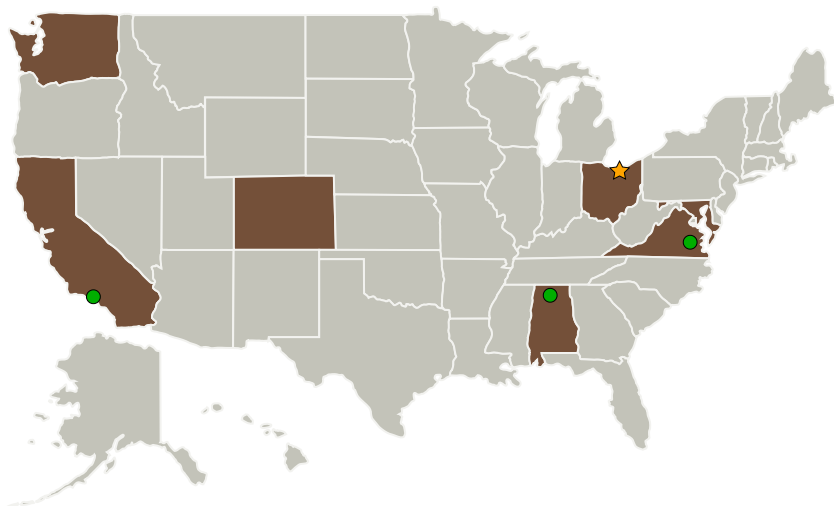
Project Introduction

The Solar Electric Propulsion Project shall develop and qualify an advanced 12.5 kW EP thruster applicable to human/robotic exploration and commercial spaceflight missions including the Power and Propulsion Element (PPE). The technology development objective of the SEP subproject, Plasma Diagnostics Package (PDP), is to develop, qualify, and deliver a flight PDP provided as GFE to PPE that can collect on-orbit PPE Ion Propulsion System (IPS) plasma data in the space environment.

Anticipated Benefits

The technology will enable the use of high power electric propulsion systems for long term missions such as cargo transports to Mars.

Primary U.S. Work Locations and Key Partners



An advanced electric propulsion system could potentially increase spaceflight transportation fuel efficiency by 10 times over current chemical propulsion technology and more than double thrust capability compared to current electric...

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Organizations Performing Work	Role	Type	Location
★ Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Aerojet Rocketdyne Holdings, Inc.	Supporting Organization	Industry	El Segundo, California
Analytical Mechanics Associates, Inc.	Supporting Organization	Industry	Hampton, Virginia
Ball Aerospace & Technologies Corporation	Supporting Organization	Industry	Boulder, Colorado
Deployable Space Systems, Inc(DSS)	Supporting Organization	Industry	Goleta, California
ExoTerra Resource, LLC	Supporting Organization	Industry	Littleton, Colorado
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia
Lockheed Martin Inc.	Supporting Organization	Industry	Palo Alto, California
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama
Northrop Grumman Systems Corporation	Supporting Organization	Industry	Falls Church, Virginia
Ohio Aerospace Institute(OAI)	Supporting Organization	Academia	Cleveland, Ohio
Orbital ATK Space Systems Group	Supporting Organization	Industry	Dulles, Virginia

Continued on following page.

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Technology Demonstration Missions

Project Management

Program Director:

Trudy F Kortes

Program Manager:

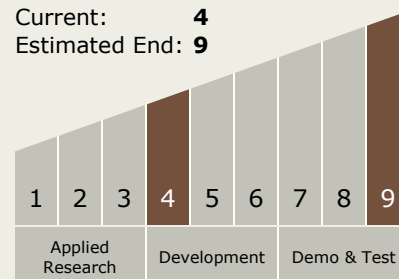
Tawnya P Laughinghouse

Principal Investigator:

Tiffany M Morgan

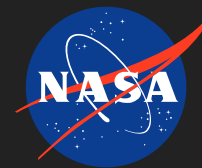
Technology Maturity (TRL)

Start: 4
 Current: 4
 Estimated End: 9



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Organizations Performing Work	Role	Type	Location
Sierra Lobo Inc.	Supporting Organization	Industry Small Disadvantaged Business (SDB)	
Space Systems/Loral, LLC(SSL)	Supporting Organization	Industry	San Jose, California
The Boeing Company(Boeing)	Supporting Organization	Industry	Chicago, Illinois

Technology Areas

Primary:

- TX01 Propulsion Systems
 - ↳ TX01.2 Electric Space Propulsion
 - ↳ TX01.2.2 Electrostatic

Target Destinations

The Moon, Mars, Others Inside the Solar System

Supported Mission Type

Planned Mission (Pull)

Primary U.S. Work Locations

Alabama	California
Colorado	Maryland
Ohio	Virginia
Washington	

Images



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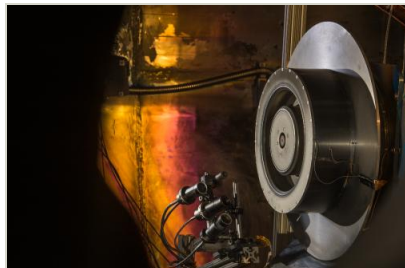
Project Image Solar Electric Propulsion (SEP)

(<https://techport.nasa.gov/image/100889>)



300V Brass-board PPU at GRC VF-5

300V Brass-board Power Processing Unit fabricated and tested, and successfully integrated and demonstrated with the Hall Effect Thruster Technology Development Unit at GRC Vacuum Facility-5 (<https://techport.nasa.gov/image/100895>)



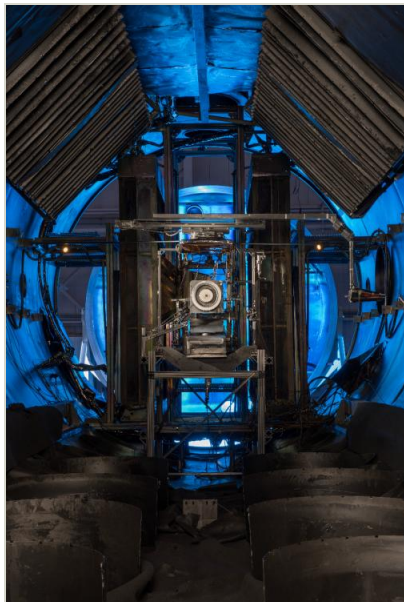
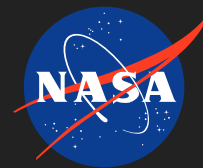
HERMeS TDU at GRC VF-5 prepared for test

Hall Effect Rocket with Magnetic Shielding (HERMeS) Technology Development Unit (TDU) thruster in Vacuum Facility-5 prepared for test. (<https://techport.nasa.gov/image/100899>)



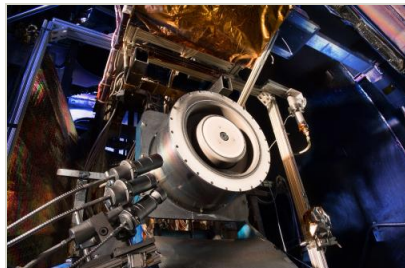
HERMeS TDU at VF-5 in test

Hall Effect Rocket with Magnetic Shielding (HERMeS) Technology Development Unit (TDU) thruster in test at Vacuum Facility-5 (<https://techport.nasa.gov/image/100877>)



HERMeS TDU in GRC VF-5

Hall Effect Rocket with Magnetic Shielding (HERMeS) Technology Development Unit (thruster) fabricated and tested in GRC Vacuum-Facility-5 to validate design methodology and tools and to reduce mission and flight hardware development risks.
(<https://techport.nasa.gov/image/100905>)



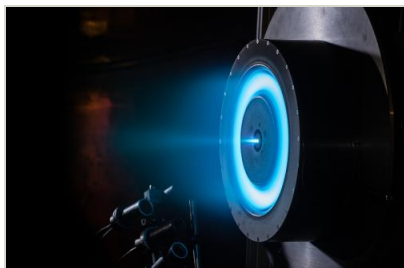
HERMeS TDU in GRC VF-5 alternate view

Hall Effect Rocket with Magnetic Shielding (HERMeS) Technology Development Unit (thruster) fabricated and tested in GRC Vacuum-Facility-5 to validate design methodology and tools and to reduce mission and flight hardware development risks.
(<https://techport.nasa.gov/image/100900>)



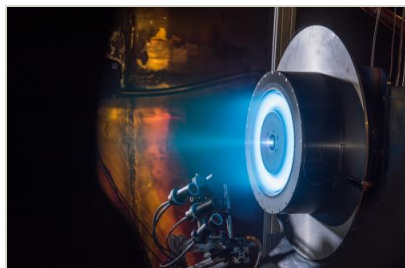
HERMeS TDU in test at GRC VF-5

Hall Effect Rocket with Magnetic Shielding (HERMeS) Technology Development Unit (TDU) thruster in test at Vacuum Facility-5
(<https://techport.nasa.gov/image/100897>)



HERMeS TDU in test at GRC VF-5 alternate view 1

Hall Effect Rocket with Magnetic Shielding (HERMeS) Technology Development Unit (TDU) thruster in test at Vacuum Facility-5
(<https://techport.nasa.gov/image/100906>)

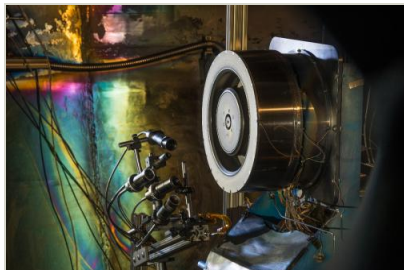
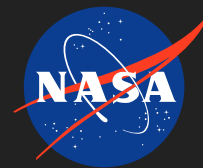


HERMeS TDU in test at GRC VF-5 alternate view 2

Hall Effect Rocket with Magnetic Shielding (HERMeS) Technology Development Unit (TDU) thruster in test at Vacuum Facility-5
(<https://techport.nasa.gov/image/100878>)

Solar Electric Propulsion (SEP)

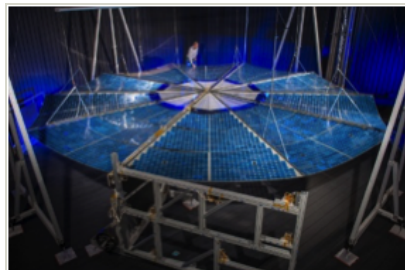
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HERMeS TDU prepared for test at GRC VF-5

Hall Effect Rocket with Magnetic Shielding (HERMeS) Technology Development Unit (TDU) thruster in Vacuum Facility-5 prepared for test.

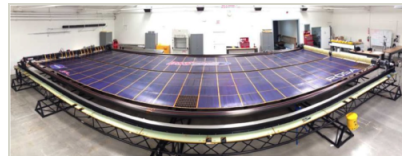
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MegaFlex

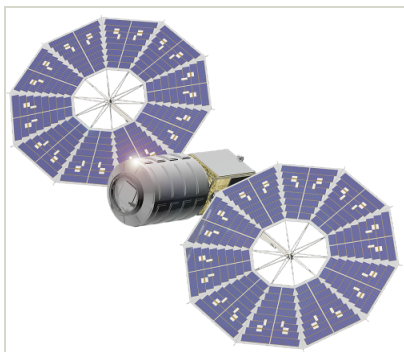
MegaFlex under Test - SAS Contract

(<https://techport.nasa.gov/image/100888>)



Rollout Solar Array

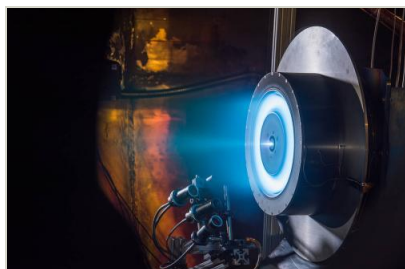
, ROSA Under Test - SAS Contract
(<https://techport.nasa.gov/image/100876>)



Solar Array concept drawing for SEP

Solar Array concept drawing for the Solar Electric Propulsion project.

(<https://techport.nasa.gov/image/100903>)



Solar Electric Propulsion (SEP).jpg

An advanced electric propulsion system could potentially increase spaceflight transportation fuel efficiency by 10 times over current chemical propulsion technology and more than double thrust capability compared to current electric propulsion technology. The next step will be to demonstrate this new electric propulsion system in space. Development of this technology will advance future in-space transportation capability for a variety of deep space human and robotic exploration missions as well as private commercial space missions.

(<https://techport.nasa.gov/image/100904>)

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Stories

Development of High-Power Solar Electric Propulsion

(<https://techport.nasa.gov/file/124532>)

Flexible solar panels power Cygnus to ISS rendez-vous

(<https://techport.nasa.gov/file/124533>)

High-power Solar Electric Propulsion HERMeS

(<https://techport.nasa.gov/file/124543>)

Lanthanum Hexaboride (LaB6) Hollow Cathode for the Asteroid Redirect Robotic Mission (ARRM) 12.5 kW Hall Thruster

(<https://techport.nasa.gov/file/124538>)

NASA Works to Improve Solar Electric Propulsion for Deep Space Exploration

(<https://techport.nasa.gov/file/124559>)

Pushing the Boundaries of Propelling Deep Space Missions

(<https://techport.nasa.gov/file/124558>)

Roll Out Solar Array Technology: Benefits for NASA, Commercial Sector

(<https://techport.nasa.gov/file/124531>)

Solar Electric Propulsion Concepts for Human Space Exploration

(<https://techport.nasa.gov/file/124534>)

Project Website:

https://www.nasa.gov/mission_pages/tdm/main/index.html#.VQb6XUjJzyE